# Learning Seminar: Étale Cohomology I

## Introduction & Contents

Étale cohomology was developed by M. Artin and A. Grothendieck in the early 60s, with the aim of producing a good intrinsic cohomology theory for schemes, analogous to that of singular and de Rham cohomology for complex manifolds. This is a learning seminar mainly intended for **undergraduates in year 3 or 4 and graduates at Fudan University**, but **everyone is welcome!**

We plan to hold a **weekly** seminar. The main reference will be *Lei Fu. Étale Cohomology*. Attendees are expected to give talks with topics listed below. They can freely develop their talks, but the contents should be concentrated to the main reference.

Here is the list of topics:

- **Basic Knowledge:**
  - Flatness.
  - Ramification.
  - Smooth and étale morphism.
  - Sheaf of differantials, cotangent bundle & canonical sheaf.
  - Henselization.
- **Étale Covering & Étale Fundamental Group:**
  - Group actions on schemes.
  - Étale covering.
  - Étale fundamental group.
- **Grothendieck Topology:**
  - Grothendieck topology.
  - Examples: fppf, fpqc, étale, etc.
  - Étale sheaf.
  - Functor $f_!$.
  - Constructible sheaf.
- **Spectral Sequence:**
  - Serre spectral sequence.
  - Grothendieck spectral sequence.
- **Derived Category & Derived Functor:**
  - Triangulated Category.

  - Derived Category.
  - Derived Functor.
- **Étale Cohomology:**
  - Étale Cohomology.
  - Étale Cohomology of curves.
  - Functor $Rf_*$ & $Rf_!$.
  - Proper base change theorem.
  - Local Acyclicity.
  - Smooth base change theorem.

# Prerequisite

The attendees should be familiar with objects in basic algebraic geometry, for example, sheaves and schemes.

# Time & Location